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MONITOR STAND WITH HEIGHT ADJUSTMENT MECHANISM

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BACKGROUND

[0001] Monitors (e.g., computer monitors, television monitors) may be supported by devices like monitor stands and monitor arms. Some devices facilitate repositioning a monitor at different vertical positions. Vertically repositioning a monitor can improve, for example, viewing angle, and glare reduction. Some conventional devices may include locking mechanisms to insure that once positioned a monitor remains fixed at the desired position. To move a monitor fixed in place by such conventional devices, a user may have to disengage a locking mechanism.

[0002] Some conventional devices are designed to carry a monitor that falls within a specified weight range (e.g., 12 to 17 pounds). For example, a counterbalancing monitor stand carrying a monitor within the specified weight range may be positioned by a user to a desired height and then held in place by the counterbalancing force and/or a locking mechanism. However, these types of conventional devices may not operate as desired if the monitor weight falls outside the design range. For example, a counterbalancing device with configurable vertical positioning that is designed to support a monitor that weighs about ten pounds may not be able to support a monitor that weighs fifteen pounds. The device may become under counterbalanced, leading to the monitor moving downwards from the desired position. Similarly, a five pound monitor on the same device may become over counterbalanced, which in turn leads to the monitor rising upwards from the desired position.

[0003] Typically, switching to a monitor whose weight is outside the weight range for a monitor stand may force a user to replace and/or reconfigure their monitor stand. Some conventional stands have addressed this issue by including variable resistance devices like reconfigurable springs and reconfigurable gas assist cylinders. But a user may not intuitively understand how to reconfigure or be able to reconfigure these stands. Furthermore, reconfiguring may involve disassembling and reassembling the stand.

BRIEF DESCRIPTION OF THE DRAWINGS

[0004] The accompanying drawings, which are incorporated in and constitute a part of the specification, illustrate various example systems, methods, and so on that illustrate various example embodiments of aspects of the invention. It will be appreciated that the illustrated element boundaries (e.g., boxes, groups of boxes, or other shapes) in the figures represent one example of the boundaries. One of ordinary skill in the art will appreciate that one element may be designed as multiple elements or that multiple elements may be designed as one element. An element shown as an internal component of another element may be implemented as an external component and vice versa. Furthermore, elements may not be drawn to scale.

[0005] Figure 1 illustrates an exploded plan view of an example height adjustment mechanism.

[0006] Figure 2 illustrates another exploded plan view of the example height adjustment mechanism.

[0007] Figure 3 illustrates an exploded side view of the example height adjustment mechanism.

[0008] Figure 4 illustrates an exploded view of an example monitor stand with a height adjustment mechanism.

[0009] Figure 5 illustrates an example monitor stand with a height adjustment mechanism.

[0010] Figure 6 illustrates forces associated with an example height adjustment mechanism.

[0011] Figure 7 illustrates forces associated with an example height adjustment mechanism.

[0012] Figure 8 illustrates forces associated with an example height adjustment mechanism.

[0013] Figure 9 illustrates an example method for adjusting the height of a monitor.

DETAILED DESCRIPTION

[0014] The following includes definitions of selected terms employed herein. The definitions include various examples and/or forms of components that fall within the scope of a term and that may be used for implementation. The examples are not intended to be limiting. Both singular and plural forms of terms may be within the definitions.

[0015] An "operable connection", or a connection by which entities are "operably connected", is one by which entities can influence and/or be influenced by other entities. For example, two entities can be operably connected by a screw associated with a first entity bearing on a surface of a second entity to create friction between the entities.

[0016] "User", as used herein, includes but is not limited to one or more persons, software, computers or other devices, or combinations of these.

[0017] While the example monitor stands and height adjustment mechanisms described herein can support objects of interest having a weight within the load carrying capacity of the monitor stands, it is understood that the example monitor stands will likely carry a flat panel monitor like a computer monitor or television. Thus, "monitor", as used herein, should be taken to include objects to be carried by the example monitor stands including, but not limited to, flat panel computer monitors.

[0018] **Figure 1** illustrates an exploded plan view of an example height adjustment mechanism that can facilitate (re)positioning a monitor carried by a monitor stand. The monitor may be, for example, a flat panel computer monitor, a flat panel television, and the like. The height adjustment mechanism may include a monitor support assembly **100** that is configured to carry, directly and/or indirectly, the weight of the monitor supported by the monitor stand associated with the height adjustment mechanism. The monitor may be mechanically connected, directly and/or indirectly, to the monitor support assembly **100**. The monitor support assembly **100** is moveable in a vertical direction to facilitate repositioning the monitor. Thus, the height adjustment mechanism may include a monitor support assembly guide **110** configured to direct and constrain the vertical motion of the monitor support assembly **100**.

[0019] In one example, the monitor support assembly **100** can be in a slidable engagement within guide tracks **115** of the monitor support assembly guide **110**. The guide tracks **115** are formed from the edges of the assembly guide **110** and define tracks or channels

that slidably receive rail edges **117** of the support assembly **100**. In another example, the male/female relationship between the rail edges **117** and the guide tracks **115** can be reversed. Furthermore, while rail edges and rails are described, it is to be appreciated that the support assembly **100** and the assembly guide **110** can be movably engaged using other apparatus known in the art.

[0020] The example height adjustment mechanism facilitates (re)positioning a monitor at a desired stationary vertical position without locking the monitor in place. In one example, being unlocked, or stationary but moveable, means that the monitor can be moved vertically by applying a force with a vertical component of less than ten Newtons to the monitor and/or a monitor support without having to take additional actions like disengaging a locking mechanism, changing a spring tension, or repositioning a gas assist cylinder stop. Furthermore, the example height adjustment mechanism facilitates carrying, one at a time, monitors with different weights, yet still facilitating (re)positioning the monitor at a desired stationary but moveable vertical position.

[0021] Thus, the height adjustment mechanism may include an assembly **120** that is configured to produce a fixed lifting force. The assembly **120** may include, for example, a gas assist cylinder **122** and a piston **124** that applies a force against gas contained in the cylinder **122**. In other examples, the assembly **120** can include a spring and other similar items known in the art for providing a fixed lifting force (e.g., a substantially constant twenty Newton force). The assembly **120** can be configured, for example, to carry a fifteen inch flat panel computer monitor that weighs ten pounds. Thus, if a ten pound monitor is carried by a monitor stand with which the height adjustment mechanism is associated, the ten pound monitor will be positionable at a stationary but moveable position. But a user may want to use a monitor stand for different monitors.

[0022] To allow adjustment, the height adjust mechanism may also include a second assembly **130** that is configured to produce a user configurable friction force. The user configurable friction force can be produced by having the second assembly **130** bear on the monitor support assembly **100** and/or the guide **110** to produce a frictional force. The user configurable friction force can work in concert with the fixed lifting force to facilitate holding a monitor in a stationary but moveable vertical position. Furthermore, the user configurable friction force facilitates having a monitor stand, equipped with the height adjustment mechanism, be able to support monitors with various weights. For example, if the user

described above upgraded from the fifteen inch flat panel monitor to a nineteen inch flat panel monitor that weighs, for example, fifteen pounds, the user may be able to employ the same monitor stand due to the availability of the user configurable friction force. By way of illustration, the assembly **120** may produce the fixed lifting force (e.g., ten pounds) to carry the fifteen inch monitor. Then, the second assembly **130** may be user-positioned to produce five pounds of frictional force by bearing on the guide **110**. Thus, the fifteen pound monitor can be carried at a stationary but moveable position by the monitor support assembly **100**.

[0023] In one example, the monitor support assembly **100** (and a monitor being carried thereby) can be moved vertically and thus carried at a different stationary but moveable location by applying a force with a vertical component of less than ten Newtons to the monitor support assembly **100** and/or the monitor. In another example, the monitor support assembly **100** (and a monitor being carried thereby) can be moved vertically and thus carried at a different stationary but moveable location by applying a force with a vertical component of less than one Newton to the monitor support assembly **100** and/or the monitor.

[0024] In one example, the second assembly **130** may include a user moveable lever configured to bear on the monitor support assembly **100** and/or the monitor support assembly guide **110** to produce the friction force. In another example, the second assembly **130** may include a user turnable screw configured to bear on the monitor support assembly **100** and/or the monitor support assembly guide **110** to produce the friction force. In another example, the second assembly **130** may include a user moveable friction plate and/or a user moveable arm configured to bear on the monitor support assembly **100** and/or the monitor support assembly guide **110** to produce the friction force. While a knob driven screw is illustrated in association with second assembly **130**, and while a screw, a lever, a friction plate, and an arm are described in association with the second assembly **130**, it is to be appreciated that other apparatus for producing a frictional force between the monitor support assembly **100** and the monitor support assembly guide **110** may be employed.

[0025] **Figures 2** and **3** illustrate different exploded pan views of the example height adjustment mechanism illustrated in **Figure 1**. While the monitor support assembly guide **110** is illustrated as including guide tracks **115** into which the monitor support assembly **100** can be inserted and move vertically as guided by the guide **110**, it is to be appreciated that other guides could be employed. By way of illustration, the monitor support assembly **100** could include a wheel that moves along a track in guide **110**. By way of further illustration,

the monitor support assembly **100** could include a tongue that inserts into a groove in guide **110**. While track, wheel, and tongue and groove examples are provided, it is to be appreciated that monitor support assembly **100** and monitor support assembly guide **110** can take various forms that facilitate producing a frictional force between the two components.

[0026] The second assembly **130**, in **Figures 1** through **3**, is a screw **132** with a knob **134** for a screwhead. The screw **132** may be seated in a threaded hole **140** in monitor support assembly **100** and be moveable in the threaded hole **140** to be able to come in contact with surface **150** of the guide **110** and thus produce a frictional force against the surface **150** that is adjustable and relative to the amount of turns applied to the knob **134**. While the second assembly **130** is illustrated being seated in monitor support assembly **100**, it is to be appreciated that the second assembly **130** could be seated in the guide **110** and/or other components that are not illustrated so long as the second assembly **130** can be user-positioned to produce a frictional force that can act together with the fixed lifting force produced by assembly **120**.

[0027] **Figure 4** illustrates a component view of monitor stand configured with a height adjustment mechanism that facilitates positioning a monitor in a user-selected stationary vertical position without locking the monitor in place. The monitor stand includes a base (e.g., base stand **440**, base plate **442**, locking screw **444**) that facilitates placing the monitor stand on a horizontal surface. In another example, the base could be configured to facilitate attaching the monitor stand to a vertical surface (e.g., a wall).

[0028] The monitor stand also includes means **120** for providing a fixed lifting force to facilitate holding the monitor in the user-selected stationary vertical position. The means **120** for providing a fixed lifting force may include, for example, one or more of springs, gas assist cylinders, other force creating components, and combinations thereof. The means **120** may be selected to support a first monitor having a selected weight or that is within a weight range (e.g., ten pound monitor).

[0029] The monitor stand may also include a guide **110** supported by the base. Additionally and/or alternatively, the guide **110** may be supported by and/or connected to one or more components that are attached to and/or supported by the base like plate **462**. While guide **110** is illustrated as having guide tracks **115** formed by the edges of the guide **110** into which an attachment assembly **100** can be inserted, it is to be appreciated that guide **110** can

take other configurations so long as they facilitate guiding the vertical motion of the attachment assembly **100**.

[0030] As described above, the monitor stand may also include an attachment assembly **100** that mounts with and moves in a vertical path dictated by the guide **110** and the guide tracks **115**. The attachment assembly **100** may include means for supporting the monitor (e.g., plate **480**, coupling device **472**). The attachment assembly **100** may not be visible since it may be covered by, for example, faceplate **470**. However, the attachment assembly **100** is configurable to receive the fixed lifting force provided by means **120**.

[0031] Thus, the monitor stand includes a height adjustment mechanism comprising means **120**, attachment assembly **100**, and a friction assembly **130**. The friction assembly **130** is operably connected to the guide **120** and/or the attachment assembly **100**. The friction assembly **130** is configured to produce a user controllable frictional force between the guide **120** and the attachment assembly **100**. The user controllable frictional force further facilitates holding the monitor in the user-selected stationary vertical position.

[0032] The height adjustment mechanism may also include a user controllable friction control operably connected to the friction assembly **130** that is configured to facilitate selectively establishing the amount of frictional force produced by the friction assembly **130**. The user controllable friction control may be manual (e.g., dial operably connected to friction assembly **130**) or automated (e.g., servo operably connected to friction assembly **130**).

[0033] In one example, the monitor, after being positioned at the user-selected stationary vertical position, can be repositioned vertically by a force with a vertical component of less than ten Newtons being applied to the monitor and/or the attachment assembly **100**. In another example, the monitor, after being positioned at the user-selected stationary vertical position, can be repositioned vertically by a force with a vertical component of less than one Newton being applied to the monitor and/or the attachment assembly **100**.

[0034] In **Figure 4**, the friction assembly **130** is illustrated as a single component, a user turnable screw. However, the friction assembly **130** is not so limited. The friction assembly **130** may include elements including, but not limited to, a lever that can produce the frictional force by bearing on the guide **110** and/or the attachment assembly **100**, a screw that can produce the frictional force by bearing on the guide **110** and/or the attachment assembly **100**, a friction plate configured to be moveable against the guide **110** and/or and the attachment

assembly **100**, where the friction plate can produce the frictional force by bearing on the guide **110** and/or the attachment assembly **100**. As described above, the friction assembly **130** can be controlled by a user controllable friction control The user controllable friction control may be, for example, a screwhead, a knob, a lever, a dial, a slider, and so on.

[0035] **Figure 5** illustrates an apparatus **500** that includes means for supplying a lifting force that facilitates vertically positioning an object in a desired stationary but unlocked position. The object may be, for example, a flat panel monitor attached to face plate **480**. The means for supplying the lifting force can include, but are not limited to, a spring, a gas assist cylinder, a lever, and a counterbalance.

[0036] The apparatus **500** may also include means for supplying a frictional force that facilitates holding the object in the desired stationary but unlocked position. The means for applying the frictional force can include, but are not limited to a screw, a knob, a plate, and an arm. The frictional force may be controlled, for example, by turning knob **510**. In one example, knob **510** may be connected to and/or be a part of a screw that bears on one or more moveable parts of apparatus **500** to produce the frictional force.

[0037] The apparatus **500** may also include means for applying the lifting force to the object and means for guiding a direction of travel of the means for applying the lifting force to the object. Thus the lifting force may be directed in a vertical direction to facilitate holding the object in a desired stationary but moveable position. Similarly, the apparatus **500** may include means for applying the frictional force between the means for guiding the direction of travel and the means for applying the lifting force. Thus, the frictional force can act in concert with the lifting force to facilitate carrying an object at an unlocked but stationary position.

[0038] **Figures 6, 7, and 8** illustrates forces involved in supporting a monitor at a stationary but moveable vertical position. **Figure 6** illustrates a portion of a monitor stand configured to support one monitor at a time. The portion of the illustrated monitor stand includes a monitor support assembly **600** that carries, directly and/or indirectly, the weight of a monitor. The monitor may be, for example, bolted to the monitor support assembly **600**, may rest on top of the assembly **600**, and so on. The portion also includes a first assembly **610** operably connected to the monitor support assembly **600** and configured to produce a fixed lifting force **Fu** that will counteract a first downward vertical force $\mathbf{Fd_1}$ produced by a

first monitor with a first weight supported by the monitor stand. The first assembly **610** may be bolted to the support assembly **600**, glued to the support assembly **600**, positioned beneath but in contact with the assembly **600**, and so on. The first assembly **610** may include, for example, a spring, a gas assist cylinder, and so on. The portion also includes a second assembly **620** operably connected to the monitor support assembly **600**. The second assembly **620** is configured to produce a configurable friction force $\mathbf{Fu_2}$ that, in combination with the fixed lifting force **Fu**, will counteract a second vertical force $\mathbf{Fd_2}$ produced by a second monitor with a second weight supported by the monitor stand, the second weight being different than the first weight. The second assembly **620** may be, for example, a screw moveably positioned in a threaded hole in assembly **600** so that the screw can be turned to come in contact with a guide **630** and thus produce a frictional force. In another example, the assembly **620** could be a screw moveably positioned in a threaded hole in guide **630** so that the screw can be turned to come in contact with assembly **600** and thus produce a frictional force. In still other examples, the second assembly **620** could include a lever, a friction plate, a gear, a dial, and so on.

[0039] Examining the forces illustrated in **Figure 6**, a first monitor may produce a downwards vertical force $\mathbf{Fd_1}$. Thus, assembly **610** may be selected and/or configured to counteract $\mathbf{Fd_1}$ by producing an upwards vertical force **Fu**. If **Fu** is substantially equal to but opposite to $\mathbf{Fd_1}$, then the monitor producing $\mathbf{Fd_1}$ will be in equilibrium with respect to vertical forces and thus positionable in a stationary but moveable vertical location. However, a second monitor may produce a downwards vertical force $\mathbf{Fd_2}$, which is greater than $\mathbf{Fd_1}$. In this case, assembly **620** can be moved (e.g., screwed in) to produce a frictional force with an upwards vertical component $\mathbf{Fu_2}$. If the combination of **Fu** and $\mathbf{Fu_2}$ are substantially equal to but opposite to $\mathbf{Fd_2}$, then the second monitor will also be in equilibrium with respect to vertical forces and thus positionable in a stationary but moveable vertical location. Thus, a single monitor stand configured with the height adjustment mechanism illustrated in **Figure 6** could accommodate different monitors with different weights without having to reconfigure a spring or gas cylinder and without having to engage and/or disengage locking mechanism.

[0040] **Figure 7** illustrates a front view of a height adjustment mechanism similar to that illustrated in Figure **6**. On the left side of **Figure 7**, the support assembly **600** has been positioned at a first vertical location within guide **630**. Thus, the assembly **610** (e.g., gas assist cylinder) has been compressed a first distance **D1**. On the right side of **Figure 7**, the

support assembly **600** has been moved to a second vertical location within guide **630** and thus assembly **610** has decompressed to distance **D2**. At either the first position or the second position, a monitor supported by support assembly **600** would be stationary but moveable, either due to the lifting force produced by assembly **610** alone or due to the lifting force produced by assembly **610** acting together with a frictional force produced by the frictional assembly **620**.

[0041] **Figure 8** illustrates a front view of a different height adjustment mechanism that employs two outwardly moveable arms instead of a screw like the height adjustment mechanism illustrated in **Figures 6** and **7**. The height adjustment mechanism includes a support assembly **800** that receives a fixed lifting force from assembly **810**. On the left side of **Figure 8**, a friction assembly **820** is in an unengaged position, where two arms **830** do not bear against guide **840**. On the right side of **Figure 8**, the friction assembly **820** is in an engaged position, where the two arms **830** do bear against guide **840**, producing a frictional force $\mathbf{Fu_2}$ that can contribute to supporting support assembly **800**. The arms **830** may be repositioned, for example, by turning a knob associated with friction assembly **820**.

[0042] Example methods may be better appreciated with reference to the flow diagram of **Figure 9**. While for purposes of simplicity of explanation, the illustrated methodology is shown and described as a series of blocks, it is to be appreciated that the methodology is not limited by the order of the blocks, as some blocks can occur in different orders and/or concurrently with other blocks from that shown and described. Moreover, less than all the illustrated blocks may be required to implement an example methodology. Furthermore, additional and/or alternative methodologies can employ additional, not illustrated blocks.

[0043] **Figure 9** illustrates a method **900** for mechanically carrying a monitor at a desired vertical position without securing the monitor in that vertical position. The method includes, at **910**, applying a first force with a vertical component to a mechanical apparatus that facilitates carrying the monitor at the desired vertical position. Method **900** also includes, at **920**, determining whether to apply a separate frictional force with a vertical component to further facilitate carrying the monitor at the desired vertical position. If the determination at **920** is No, then no additional frictional force is applied to the mechanical apparatus. But if the determination at **920** is Yes, then method **900** can include, at **930**, selectively applying an additional frictional force to the mechanical apparatus so that the combination of the first

force and the frictional force cause the monitor to be carried at the desired vertical position without securing the monitor in that vertical position.

[0044] The first force may be generated by apparatus including, but not limited to, a spring, a gas assist cylinder, a lever, and a counterbalance. The frictional force can be generated by apparatus including, but not limited to, a screw, a knob, a plate, an arm, and a lever. In one example, the monitor can be moved from the desired vertical position, without adjusting the first force or the frictional force, by applying a force with a vertical component of less than ten Newtons. In another example, the monitor can be moved from the desired vertical position, without adjusting the first force or the frictional force, by applying a force with a vertical component of less than one Newton.

[0045] While **Figure 9** illustrates various actions occurring in serial, it is to be appreciated that various actions illustrated in **Figure 9** could occur substantially in parallel. By way of illustration, a first process could apply the first force while a second process could substantially continuously and/or periodically determine whether to apply an additional frictional force and a third process could selectively apply the additional frictional force. While three processes are described, it is to be appreciated that a greater and/or lesser number of processes could be employed and that lightweight processes, regular processes, threads, and other approaches could be employed.

[0046] While example systems, methods, and so on have been illustrated by describing examples, and while the examples have been described in considerable detail, it is not the intention of the applicants to restrict or in any way limit the scope of the appended claims to such detail. It is, of course, not possible to describe every conceivable combination of components or methodologies for purposes of describing the systems, methods, and so on described herein. Additional advantages and modifications will readily appear to those skilled in the art. Therefore, the invention, in its broader aspects, is not limited to the specific details, the representative apparatus, and illustrative examples shown and described. Accordingly, departures may be made from such details without departing from the spirit or scope of the applicants' general inventive concept. Thus, this application is intended to embrace alterations, modifications, and variations that fall within the scope of the appended claims. Furthermore, the preceding description is not meant to limit the scope of the invention. Rather, the scope of the invention is to be determined by the appended claims and their equivalents.

[0047] To the extent that the term "includes" or "including" is employed in the detailed description or the claims, it is intended to be inclusive in a manner similar to the term "comprising" as that term is interpreted when employed as a transitional word in a claim. Furthermore, to the extent that the term "or" is employed in the detailed description or claims (e.g., A or B) it is intended to mean "A or B or both". When the applicants intend to indicate "only A or B but not both" then the term "only A or B but not both" will be employed. Thus, use of the term "or" herein is the inclusive, and not the exclusive use. See, Bryan A. Garner, A Dictionary of Modern Legal Usage 624 (2d. Ed. 1995).